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MOL-HSQ

CONTRACT AF04(695)-150

INSTALLATION AND CHECKOUT SPECIFICATION FOR MOL-EFT-AGE

MOL-EFT-ICS-5100

15 DECEMBER 1965

MARTIN COMPANY
DENVER, COLORADO

AEROSPACE DIVISION OF MARTIN-MARIETTA CORPORATION

FOREWORD

This document is submitted under Line Item 3C20 in accordance with Contractor's Specification, SSS-TIII-010 DRD (Rev. 3), dated 15 April 1963, DSCNs 1 thru 124 as incorporated in Item 1 of Exhibit A, Task 5.13 of Contract AF04(695)-150.

This document is approved by SCD S3-3386 (Martin Ref. 5W18693) and CCN 1451, dated 29 December 1965 (Martin Ref. 6W00978).

CONTENTS

Installation and Checkout Specification
for MOL-EFT-AGE

1.0 SCOPE

1.1 General - This specification establishes the requirements for all installation effort, materials, and checkouts associated with the installation of Government Furnished HSQ Gemini Spacecraft AGE only, hereinafter referred to as GFE. NOTE: Installation and checkout of CFE is covered by Addendum I to Specification SSS-TIII-00R ICS/AMR.

2.0 APPLICABLE DOCUMENTS

2.1 General - The following documents of the issue indicated form a part of this specification to the extent specified herein. In case of conflict between the requirement of this specification and any document referenced herein, this specification shall govern.

2.2 Government Specification

2.3 Military Standards

MIL-STD-143	Specifications and Standards, Order of Precedence, 15 June 1960
MS-33586A	Metals, Definition of Dissimilar, 16 December 1958
MIL-STD-130B	Identification Marking, U.S. Military Property, dated 24 April 1962
MIL-STD-143	Specifications and Standards, Order for Precedence, 15 June 1960
MIL-STD-210A-(1)	Climatic Extremes for Military Equipment, dated 30 November 1958
MIL-STD-1247A	Identification of Pipe, Hose, and Tube Lines for Aircraft, Missile and Space Systems, dated 17 August 1964

2.4 Air Force-Navy Aeronautical Bulletins

ANA Bulletin 147	Specifications and Standards of Non-Government Organizations, approved for Flight Vehicle Construction, dated 1 February 1962

2.5 Contractor Prepared Documents

IFS-MOL-EFT-60002	Gemini/Gemini AGE to MC AGE Interface Specification, dated 29 October 1965
SSS-TIII-00R ICS/AMR	Installation and Checkout Specification, SSLS, AMR, dated 12 September 1962
SSS-TIII-210 CCS	Contamination Control Specification for Equipment and Fluids, SSLS, dated 6 September 1962
808D1R00H00	Integrate, Transfer, and Launch Installation, MOL-HSQ
808D1R00G00	Launch Complex 40, MOL-HSQ

2.6 Society Specifications

ASA A58.1	Minimum Design Loads in Buildings and other Structures, Building Code Requirements for, dated 1955
B3.0	American Welding Society Standard Qualification Procedure
NEC	National Electric Code, dated October 1962

2.7 Miscellaneous Documents

MTP-AERO-61-78	Surface Wind Statistics for Patrick AFB (Cape Canaveral) 10 October 1961

3.0 REQUIREMENTS

3.1 General - The installation effort, materials, and checkout of GFE at Complex P-40 and the VIB shall meet the requirements specified herein. This specification establishes the extent of checkout to be performed to verify that the installation complies with the installation requirements set forth herein.

3.1.1 Safety - All installation design, installation and checkout operations shall incorporate maximum protection for operating and maintenance personnel against hazardous conditions. Adequate provisions shall be made to warn and/or protect personnel and equipment from injury and damage.

3.1.2 Beneficial Occupancy Date (BOD) - Installation and checkout shall commence at BOD in accordance with the MOL-HSQ Master Schedule. Beneficial Occupancy Date is that date which the facility is made available by letter or assignment, to the Contractor, prior to the construction contract completion date. The facility shall be operational and complete including all operational lists. Minor corrective actions only shall remain to be completed by the construction contractor. The construction contractor's cleanup schedule for such minor corrective actions shall be subordinate to and established by the Integrating Contractor's work schedule.

3.1.3 Interfaces - Installation interfaces for GFE shall be in accordance with IFS-MOL-EFT-60002.

3.2 Installation

3.2.1 General - The installation of GFE and material used in these installations shall be in accordance with Contractor-prepared installation drawings and shall be compatible with existing equipment.

3.2.1.1 Installation Drawings - All drawings for installation of GFE shall be prepared in accordance with standard commercial practices and shall include all applicable requirements specified herein.

3.2.1.2 Materials, Parts, and Processes - The selection and application of suitable materials, parts, and processes shall be in accordance with the following:

a. The materials, parts, and processes specified herein shall be those deemed by the Contractor to be suitable for the application without degrading the requirements specified herein. In general, commercially available parts, the Contractor's standard processes (or Contractor approved equivalent processes), and materials generally used by industrial organizations engaged in

3.2.1.2 (cont.)

a. similar operations shall be used. Unless specifically requested, the Contractor shall not be required to obtain approval of the procuring agency to use any such materials, parts, or processes; neither shall the Contractor be required to prepare, accumulate, or submit any justification data for the use of such material, parts, or processes to the procuring agency.

b. When commercial parts and materials do not meet the design requirements specified herein, standard parts and materials shall be used. These standards shall be selected in general accordance with the order of precedence specified in MIL-STD-143.

c. Realistic design reviews shall be used by the Contractor to evaluate and approve the selection and application of the material, parts, and processes.

d. All material, parts, and processes shall be spec on the installation drawings and specifications to dire ocurement and utilization of an item of required quality.

3.2.1.3 Maintainability - Maintainability shall be an inherent feature in the installation design and shall conform to and preserve the maintainability requirements incorporated into the GFE.

3.2.1.4 Reliability - The Reliability of the installation design shall preserve the Reliability of the AGE.

3.2.1.5 Human Engineering - Human Engineering shall be considered in the installation design of the GFE. The installation shall permit the equipment to be compatible with human capabilities and shall provide optimum utilization of the installed equipment by adequate consideration for human limitations.

3.2.1.6 Environmental Requirements - The installation and installation hardware shall be designed to meet the environmental requirements specified in Table I herein.

3.2.1.7 Contamination Control - Contamination control of fluids and installed systems shall be in accordance with the requirements specified in the Contamination Control Specification for Equipment and Fluids, SSLS, SSS-TIII-210 CCS.

3.2.1.8 Dissimilar Metals - The selection and use of dissimilar metals, as defined in MS-33586, in direct contact with each other in accomplishing installation tasks shall be avoided to reduce possibilities of galvanic corrosion. In cases where contact of dissimilar metals cannot be avoided, the metals shall be coated with a suitable plating or finish, or the affected

3.2.1.8 (Cont'd)

metals shall be separated by a suitable insulation material.

3.2.1.9 Electrical Bonding and Grounding - All racks, consoles, pallets and the outer cases or containers of all fixed mounted GFE items shall be electrically bonded and grounded to the facility grounding system.

3.2.1.10 Identification - Identification and marking shall conform to the applicable portions of MIL-STD-130.

3.2.1.11 Receiving Inspection - Prior to installation, all GFE requiring installation shall have undergone receiving inspection. This receiving inspection shall be limited to a visual inspection to ascertain that no damage has occurred to the equipment, and that all ports and connectors are protected.

TABLE I

THE FOLLOWING CRITERIA WILL BE ADHERED TO BY THE INSTALLATION DESIGN

GROUND EQUIPMENT ENVIRONMENTAL DESIGN REQUIREMENTS

Configuration Location \ Design Wind Velocity Limits @ a height above ground	40 MPH @ Ht = 10 ft. Above Grd.	46.5 MPH @ Ht = 30 ft. Above Grd.[2]	60 MPH @ Ht = 30 ft. Above Grd.[3]	125 MPH @ Ht = 30 ft. Above Grd.[4]
1. Vehicle transporter equipment/ACE van/locomotive with or without the SSLV in transit.		Mobile	Without SSLV Immobile	
2. Vehicle Transporter without undercarriage with SSLV - on the launch pad	For Launch only 1	Pre Launch		
3. Vehicle transporter without undercarriage without the vehicle on pad or unsheltered storage			Without Aux. Sup't	With Aux. Sup't
4. Umbilicals		Pre Launch	Without Aux Sup't Without/ SSLV	Without SSLV with sup't
5. Permanently installed GFE - unsheltered				Without Aux. Sup't

NOTE: All winds include gusts.

1. MIL-STD-210A Wind Profile
2. NASA 99.9 Wind Curve of MTP-AERO-61-78.
3. & 4. 1/7 Power Wind Profile Per ASA A58.1

TABLE I - CONTINUED

GROUND EQUIPMENT ENVIRONMENTAL DESIGN REQUIREMENTS

	NON-OPERATING	OPERATING (Unless noted otherwise)		
5. ENVIRONMENTAL FACTORS	"A" Transportation Storage & Handling (packaged except as noted otherwise) non-operating	"B" Air Conditioned Areas a) Enclosed equipment areas in equipment building. b) Control Center See Note 4	"C" Sheltered Areas enclosed by roof and walls a) Van level in Age Building See Note 4	"D" a) Open Areas b) Roofed but unwalled areas. See Note 3 See Note 4
6. TEMPERATURE	Unpackaged: -35 to 160°F	62 to 82°F See Note 1	50 to 105°F Max. Temp 90° for Van Level in the AGE Bldg.	a) 25 to 140°F* b) 25 to 105°F See Note a.
7. HUMIDITY	0 to 100% R.H.	0 to 55% R.H.	0 to 100% R.H. except area c) 0 to 65% R.H.	0 to 100% R.H.
8. ALTITUDE	0 to 15,000 ft. (15 to 8.3 psia)	0 to 6000 ft. (15 to 11.7 psia)	0 to 6000 ft. (15 to 11.7 psia)	0 to 6000 ft. (15 to 11.7 psia)
9. VIBRATION	Unpackaged: No Requirement	No Requirement	No Requirement	Thrust Mount & Umbilical Tower $0.02g^2$ cps 5 to 1000 cps - 4.5 GRMS overall

NOTE: *a. Open area water systems 35° to 140°F.

TABLE I - CONTINUED

GROUND EQUIPMENT ENVIRONMENTAL DESIGN REQUIREMENTS

	NON-OPERATING	OPERATING (unless noted otherwise)		
	"A"	"B"	"C"	"D"
10. ACOUSTIC NOISE	No Requirement	a) and e) only: See Note 5	As defined in Fig.1 and modified by bldg. attenuation	As defined in Fig. 1*
11. SALT FOG	Equiv. to 50 hrs Exposure to 20% Salt Fog Solution (non-operating)	No Requirement	No requirement	Equiv. to 50 hrs exposure to 20% Salt Fog Solution (non-operating)
12. WIND	No Requirement	No Requirement	No Requirement	See first sheet of Table 1
13. RAIN	4 in/hr for 2 hrs.	No Requirement	No Requirement	Open Areas: 4 in/hr for 2 hrs. (non-operating)
14. FUNGUS	Equivalent to 28 days in a fungus chamber	No Requirement	Equivalent to 28 days in a fungus chamber (non-operating)	Equivalent to 28 days in a fungus chamber (non-operating)
15. SAND & DUST	2300 ± 500 fpm	No Requirement	No Requirement	2300 ± 500 fpm (non-operating)

* Figure 1 - Same as SSS-TIII-OOR ICS/AMR Figure 1

TABLE I - CONTINUED

GROUND EQUIPMENT ENVIRONMENTAL DESIGN REQUIREMENTS

	NON-OPERATING	OPERATING (Unless noted otherwise)		
	"A"	"B"	"C"	"D"
16. EXPLOSIVE ATMOSPHERE	Not Applicable	No Requirement	See Note 6	
17. PROPELLANT COMPATIBILITY	No Requirement	No Requirement	Contact with liquid and vapor phases of Hydrazine and UDMH and N_2O_4 See Note 2	
18. STORAGE LIFE	3 years in a semi-sheltered area	Not Applicable	Not Applicable	Not Applicable
19. SUNSHINE	Unpackaged: Materials shall withstand sunshine	No Requirement	No Requirement	Materials shall withstand sunshine
20. SHOCK	Unpackaged Bench Handling: 4 in. pivot drops and 1 in. free drops from all probable orientations.	No Requirement	No Requirement	No Requirement

TABLE I - CONTINUED

GROUND EQUIPMENT ENVIRONMENTAL DESIGN REQUIREMENTS

Note 1 - Temperature in the mobile AGE vans is not controlled during transient. During such periods equipment must withstand exposure to temperatures from -35 F to 160 F while not operating.

Note 2 - Propellant Compatibility - The exposed materials that comprise the surfaces of equipment located on the launch stand or near propellant storage and handling equipment shall be selected to withstand exposure to propellant fumes for one hour, or splash for one minute, of the applicable propellants. Where the requirements cannot be met, suitable replacement and maintenance procedures shall be implemented. For materials normally in contact with the propellants, the degradation of physical properties after an exposure of three months shall be within design limits.

Note 3 - Portable Equipment - With Portable Equipment stored indoors but used outdoors, it shall be a design objective, not a design requirement, to withstand wind, salt fog, rain, sand and dust, and sunshine.

Note 4 - Equipment will be operating unless otherwise specified.

Note 5 - The equipment located in the equipment building and AGE vans required to operate between solid motor ignition and umbilical release, shall successfully perform the functions required during this period while exposed to 120 db overall random acoustic energy from 2 cps to 10,000 cps. All equipment located in these areas during vehicle liftoff shall withstand 10 seconds exposure to 140 db overall random acoustic energy from 2 cps to 10,000 cps without incurring damage preventing subsequent performance of required functions. The level of 140 db shall be taken as not sufficiently deleterious of AGE to warrant development test programs. Tests may be required on some selected acoustically susceptible assemblies as defined in contractor-prepared SSD approved documentation.

Note 6 - Installation in hazardous areas shall conform to the NEC requirements for Class I, Division II, Groups B or D as applicable except that in cases where equipment is unavailable or cost is prohibitive to meet the requirement, operating procedures may be used to exempt items of equipment, e.g., de-energization of circuits prior to disconnection.

3.2.2 Electrical Installation Practices and Processes - The installation of all GFE cabling and electrical equipment shall be in accordance with the requirements set forth herein and the applicable installation drawings. Wherever the grade of electrical work is not specifically indicated on the drawings or in this specification, as a minimum the work shall conform to the requirements set forth in the National Electric Code (NEC) with the following exceptions:

a. Open cable trays are permissible

b. More than one layer of cabling may be installed in any cable tray.

3.2.2.1 Cabling

3.2.2.1.1 Routing - Individual cables shall be made up insofar as possible to include only one of the categories listed below. Cables of the same category may be routed together, but separate from cables of all other categories to the maximum extent possible.

Categories

a. All AC power distribution, high transient, and steady-state DC circuits above 5 amps, and communication circuits above 6 milliwatts.

b. Transient and steady-state DC circuits between 100 milliamps and 5 amps.

c. Low level signals of less than 36 vdc peak and current less than 100 milliamps, communication signals with power less than 6 milliwatts.

d.1 Normal ordnance circuits.

d.2 Destruct ordnance circuits

e. Radio frequencies 100 kc and above

3.2.2.1.2 Cable Bends - Cabling shall be dressed into the cable trays as directly as possible with a minimum amount of bending. The minimum radius to which an insulated conductor or cable is bent shall be seven times the diameter of the outer jacket unless otherwise indicated by the drawings or as recommended by the cable manufacturer.

3.2.2.2 Connectors - Contractor furnished connectors required for terminations at GFE shall meet or exceed the functional requirements specified herein.

3.2.2.3 Umbilical and Checkout Cables -

3.2.2.3.1 Support - The GFE spacecraft umbilical cables shall be supported to restrain the cables from sharp bends or concentrated loads on the cables in accordance with applicable installation drawings.

3.2.3 Mechanical Installation Practices and Processes

3.2.3.1 General - The installation of all GFE mechanical equipment shall be in accordance with the requirements set forth herein and the applicable installation drawings.

3.2.3.2 Equipment

3.2.3.2.1 Tie Down and Support - Equipment shall be mounted or secured in accordance with the installation drawings. No support methods shall be used that will restrict the normal movement of personnel to or from equipment access areas.

3.2.3.2.2 Welding - All welding and all qualification of welders shall conform with the applicable provisions of AWS Standard Code for Arc and Gas Welding or ASME Boiler and Pressure Vessel Code.

3.2.4 Installation Requirements - This section establishes all Contractor requirements for design, locating of equipment, procurement of materials, and associated construction effort that is necessary to accomplish the installation of Government-Furnished Equipment for implementing the MOL-HSQ Program at AMR. This effort shall be accomplished in the form of independently identified modification additions to the existing major geographical area installation end-items furnished at AMR to implement the 624A Program as described in the SSS-TIII-00R ICS/AMR Specification.

3.2.4.1 Installation End-Item Identification - The deliverable installation end-items associated with the installation of Government-Furnished Equipment for the MOL-HSQ Program at AMR shall be identified by the following part numbers and nomenclature. Each installation end-item shall be considered to be completed when all Government-Furnished Equipment items have been installed and on-site fabrications have been accomplished in accordance with the corresponding installation drawing packages identified in Paragraph 3.2.4.3 below; when services are available; and when all associated checkouts (as identified in Sections 3.3 and 4.0 herein) have been completed:

	End Item Part No.	End Item Nomenclature
a.	808D1R00H00	Integrate, Transfer, and Launch Installation, MOL-HSQ
b.	808D1R00G00	Launch Complex 40, MOL-HSQ

Note: Although the above mentioned complete installation end-items actually comprise the total deliverable configuration of the MOL-HSQ program peculiar installation product at AMR (includes all efforts associated with the installation of both CFE and GFE items), the scope of this specification is concerned only with delivery of those portions of the total configuration which involve Contractor-Furnished material and effort required to install GFE items.

Those remaining portions of the total configuration which involve Contractor requirements for material and effort associated with the installation of CFE items shall be controlled within the scope of the Addendum I to SSS-TIII-OOR ICS/AMR Specification.

3.2.4.2 Installation End-Item Configuration and Control - Associated with each of the installation end-items identified in Paragraph 3.2.4.1 above is a corresponding installation drawing package which shall identify the hardware configuration of the major geographical area end-items and shall define all requirements for effort to be expended in producing that end-item. Each of the installation drawing packages identifed in Para. 3.2.4.3. below shall embody the following MOL-HSQ Program requirements.

3.2.4.2.1 Fixed Installation of GFE - All GFE items required as part of a deliverable installation end-item and as listed in Table II herein (although such items are not actually considered to be procured as part of the installation end-item) shall be installed and located in the manner specified in the applicable installation drawing package.

3.2.4.2.2 Storage for Mobile or Portable GFE Items - Provisions, as required, for suitable storage of all GFE items listed in Table II that are in nature portable or mobile shall be included as part of the deliverable installation end-item in accordance with the applicable installation drawing package.

3.2.4.2.3 Installation Materials and Effort - All material and effort required to complete each installation end-item (excluding the procurement of GFE items listed in Table II) shall be provided as part of that end-item. Such material shall be identified and procured by the Contractor in accordance with instructions provided in the applicable installation drawing package.

3.2.4.2.4 Configuration Control - The initial scope of Contractor installation effort required to successfully support all MOL-HSQ Program requirements at AMR shall be defined as being that end-item configuration described by the basic released versions of each installation drawing package. All Class I modifications to the initial Contractor installation effort shall be identified in sub-paragraphs listed beneath each of the affected installation drawing packages identified in Paragraphs 3.2.4.3.1 and 3.2.4.3.2.

3.2.4.2.5 Installation Removal - The Contractor shall remove the two end-items in Paragraph 3.2.4.1 at the completion of the MOL-HSQ Program. However, prior to the completion of the HSQ Program, an analysis of the installed material and equipment shall be conducted to determine; 1) which items shall be removed; 2) which items shall be disconnected and stored in place; and 3) which items shall remain installed intact for possible future incorporation into the Titan III system.

3.2.4.3 Installation Drawing Packages - Each of the installation drawings in Paragraphs 3.2.4.3.1 and 3.2.4.3.2 correspond to and identify hardware configuration and effort required to complete one deliverable installation end-item as defined in Paragraph 3.2.4.1. Class I modifications to each end-item (which becomes fully defined upon basic release of the drawings) shall be identified in sub-paragraphs beneath each affected drawing package. Class I modifications shall be categorized beneath each of the drawing packages according to the implementing design discipline; i.e., Mechanical, Structural, Electrical Outfitting, Interconnections, and R. F. Transmission System.

3.2.4.3.1	808D1R00H00 (V)	Integrate, Transfer, and Launch Installation, MOL-HSQ.
3.2.4.3.2	808D1R00G00 (V)	Launch Complex 40 MOL-HSQ

EQUIPMENT LIST, GFE

TABLE II

MAC PART NO.	NOMENCLATURE	COMPLEX LC-40	ITL/ GEN
	Mechanical AGE		
52E420013	Pressurization Unit	X	
52E420136	First Stage N_2 Regulator Panel	X	
52E180038	Terminal Box	X	
52E420056	Second Stage N_2 Regulator Panel	X	X
52E420098	Vapor Detector Unit	X	
52E180139	RCS Emergency Purge N_2 Panel	X	
To be supplied by MAC on 1-3-66	Shop Tool Air Disconnect	X	
	Electrical AGE		
58E230802	Checkout Console-Power and Sequential (T/M System)		X
58E270063	Cabinet Assembly-Guidance and Control System Monitors		X
58E230068	Console Spacecraft Test Conductor		X
52E420007	Control and Monitor Unit Propulsion System (RCS)		X
52E440052	Power Supply Assembly Telemetry Remote-Displays		X
58E440503	Remote Control Encoder		X
MCE 0826	MAC Countdown Generator		X
52E230058	Battery Rack-External Control and Monitor Back-up	X	
52E180004	Service Unit - S/C Coolant System	X	
52E180172-3	Coolant Unit, S/C Ground	X	
No Part Number	(1) Umbilical Cable 3.6" Diameter		X

EQUIPMENT LIST, GFE

TABLE II

MAC PART NO.	NOMENCLATURE	COMPLEX LC-40	ITL/ GEN
	Electrical AGE		
No Part Number	(15) Checkout Cables 1.75" Diameter		X
No Part Number	(3) Battery Back-up Cables 1.5" Diameter	X	
No Part Number	(7) Cables from MAC AGE to Disconnect Panel		X
No Part Number	(13) Cables between MAC AGE Racks		X
No Part Number	(3) Cables from GEEIA Interface MAC AGE		X
No Part Number	(4) Cables from GEEIA Interface to T/M Van		X
No Part Number	(3) Cables from MAC 404 Rack to Disconnect Panel		X
No Part Number	(7) Cables from GEEIA Interface to OGE Van #1	X	
No Part Number	(1) Acme IT Panel		X
No Part Number	(2) Sets of Filtering Capacitors		X
No Part Number	(1) Split Phase Converter		X
No Part Number	UHF Reradiating Antenna	X	
No Part Number	C Band Reradiating Antenna	X	

3.3 Checkout

3.3.1 General - Checkout specified herein shall be performed to verify proper installation of the GFE specified in Table II. All checkouts shall be performed in accordance with Integrating Contractor's prepared test procedures. The Contractor shall not be responsible for conducting functional end to end and overall testing of the GFE listed in Table II.

3.3.1.1 Prerequisites - The following requirements shall be met, prior to initiation of any particular checkout.

a. Facility and/or range equipment items shall be available for use as required to support the individual checkouts specified herein.

b. All factory built deliverable GFE shall have undergone functional performance verification at place of manufacture.

c. Applicable checkout procedures as defined herein are available.

3.3.1.2 Sequence - Checkouts and portions thereof may be performed in any sequence.

3.3.1.2 Environmental Limitations - Environmental limitations for the performance of checkouts shall be the environmental extremes as specified in Table I.

3.3.2 Electrical Installation Checkout - The electrical installation of GFE listed in Table II shall be checked to verify:

a. Quality of workmanship.

b. That cables and connectors have not been torn, cracked, or otherwise damaged.

c. Compliance with the requirements of the applicable installation drawing and the requirements of Section 3.2 herein special emphasis placed on routing, placement of cable "ties", and materials and processes used in effect the installation.

NOTE: At no time shall electric power be applied directly to GFE items.

3.3.2.1 Electrical Bonding - The grounding of all racks, consoles, pallets, and outer cases or containers of all fixed mounted GFE in Table II to the facility grounding system shall be verified.

3.3.2.2 Antenna Orientation Checkout - The reradiating antennas shall be checked to assure that each is oriented in an optimum manner to transmit or receive a maximum amount of radiated energy.

3.3.2.3 Continuity - With the cables disconnected from the equipment, checks shall be made for point-to-point continuity for absence of short circuits and for absence of inadvertent grounds. Intermediate connection points such as termination racks shall be left connected for this checkout.

3.3.2.4 Grounding Check - With all grounding contactors that connect the D-C negative power lines to facility ground in an "open" position, a measurement of electrical resistance shall be made between the D-C negative power lines at each umbilical disconnect and facility ground to assure that all D-C negative power lines (including Associate Contractor interconnections) are isolated from the facility. With the transporter system on the pad, resistance shall not be less than 25,000 ohms. With the contactors in a "closed" position, the resistance to facility ground shall not exceed 0.2 ohms.

3.3.3 Mechanical Installation Checkout - The mechanical installation of GFE in Table II shall be checked to verify:

a. Quality of workmanship

b. Compliance with requirements of the applicable installation drawings and the installation requirements of Section 3.2 herein.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 General - The installation checkout of the GFE listed in Table II shall be in accordance with the requirements of Section 3 herein.

4.2 Responsibility - The Martin Company, herein referred to as the Integrating Contractor, shall provide installation material and shall install all GFE in Table II in accordance with the requirements specified herein. Installation by the Integrating Contractor shall include an initial installation of Government-Furnished Equipment in the launch complex. The Integrating Contractor shall not be responsible for performance of functional checkout of the GFE listed in Table II. The Integrating Contractor shall be responsible for all checkout activities specified herein.

4.3 Acceptance - Acceptance requirements shall be as set forth herein below.

4.3.1 Installation and Checkout Acceptance - The installation and checkout effort for each installation drawing listed in Paragraph 3.2.4.1.1 herein, shall be accomplished in accordance with the requirements of Section 3 herein. Upon completion of the total installation and checkout effort, for which the Contractor is responsible, a single Inspection form shall be submitted for local AFQC approval.

4.3.2 Final Acceptance - The Inspection form, executed as set forth in Paragraph 4.3.1, shall constitute the basis for final acceptance of the installation and checkout effort, for which the Contractor is responsible. Final Acceptance will be by COC. A COC shall be issued for each installation end-item as defined in Paragraph 3.2.4.1 when affected checkouts as defined in Paragraph 3.3 have been successfully completed.

4.4 Checkout Procedure Submittal and Notification - Checkout procedures shall be prepared and implemented by the Contractor. The Contractor shall notify local AFQC not later than twenty-four (24) hours prior to the scheduled start of a checkout.

4.5 Calibration - Test equipment and other quantitative measuring devices used during installation and checkout shall be calibrated as required.

4.6 Limiting Ambient Conditions - During checkout, the limiting ambient conditions shall be the extreme ambient conditions specified in Table I.

5.0 PREPARATION FOR DELIVERY

There are no applicable provisions.

6.0 NOTES

6.1 Abbreviations

AC	Alternating Current
AFQC	Air Force Quality Control
AGE	Aerospace Ground Equipment
AMR	Atlantic Missile Range
AMPS	Amperes
ASME	American Society of Mechanical Engineers
Aux	Auxiliary
AWS	American Welding Society
BOD	Beneficial Occupancy Date
CFE	Contractor Furnished Equipment
COC	Certificate of Completion
cps	Cycles per second
db	Decibel
DC	Direct Current
EQUIV	Equivalent
^{o}F	Degrees, Fahrenheit
FIG	Figure
fpm	Feet per minute
Ft	Feet
g	Gravity
GEEIA	Ground Electronic Engineering Installation Agency
GFE	Government-Furnished Equipment
GEN	General
GIE	Ground Installation Equipment
Ht	Height
Grd	Ground
GRMS	Gravity, Root Mean Square
HSQ	Heat Shield Qualification
Hrs	Hours
In	Inches
In/hr	Inches per hour
ITL	Integrated Transfer Launch
KC	Kilocycles
lb/min	Pounds per minute
LC	Launch Complex
MAC	McDonnell Aircraft Corporation
MAX	Maximum
MC	Martin Company
MGE	Maintenance Ground Equipment
Milliamps	Milliamperes
MOL	Manned Orbiting Laboratory
MPH	Miles Per Hour
N_2	Nitrogen

6.1 Abbreviations (Cont'd)

NEC	National Electric Code
No	Number
N_2O_4	Nitrogen Tetroxide
OGE	Operating Ground Equipment
PARA	Paragraph
psia	Pounds per square inch absolute
RCS	Reaction Control System
RF	Radio Frequency
R.H.	Relative Humidity
SSD	Space Systems Division
SSLS	Standard Space Launch System
SSLV	Standard Space Launch Vehicle
Sup't	Support
Temp	Temperature
T/M	Telemetry
UDMH	Unsymmetrical Dimethyl Hydrazine
UHF	Ultra High Frequency
VDC	Volts, Direct Current
VIB	Vertical Integration Building

6.2 Definitions

AGE - Aerospace Ground Equipment (AGE) is that portion of the ground system that includes OGE and MGE.

OGE - Operating Ground Equipment (OGE) is that ground equipment necessary for checkout and launch, used to support the performance of the space vehicle as the major operational element of the space system.

Facility - The total launch complex and its support areas required to support a space system, exclusive of AGE and GIE.

Installation - Those operations and processes required and performed to set-up and secure equipment for use and service.

MGE - Maintenance Ground Equipment (MGE) shall be that equipment required to restore a space system, support system, end item, or component to operating condition.

SUPPLEMENTARY

INFORMATION

MARTIN COMPANY
DENVER DIVISION

CONTRACT NO. AF 04(695)-150

SPECIFICATION

CHANGE NOTICE

NO. 1
DATE 26 April 1966

SPEC NO. MOL-EFT-ICS-5100
TITLE Installation and Checkout Specification for MOL-EFT-AGE
DATED 15 December 1965
REVISION NO. DATED

PURPOSE OF CHANGE: This change redefines the grounding test between the D.C. negative power lines and facility ground. This change incorporates SCNP B (UCN 40024A) as approved by SCD C3-3618, dated 8 April 1966 (Martin Ref: 6W05374)

INSTRUCTIONS: Replace page 18 with revised page 18.

AUTHORIZATION: SCD C3-3618 dated 8 April 1966 (Martin Ref: 6W05374) and CCN 1637, dated 9 April 1966 (Martin Ref: 6W05820).

File this page in front of subject document to indicate the latest change.

BUREAU OF BUDGET APPROVAL NO. _____

D. A. Lemistow
APPROVAL

3.3.2.3 Continuity - With the cables disconnected from the equipment, checks shall be made for point-to-point continuity for absence of short circuits and for absence of inadvertent grounds. Intermediate connection points such as termination racks shall be left connected for this checkout.

(SCN 1) 3.3.2.4 Grounding Check - With all grounding contactors that connect the Gemini D.C. negative power lines to facility ground in an "open" position, a measurement of electrical resistance shall be made between the D.C. negative power lines at each umbilical disconnect and facility ground to assure that all D.C. negative power lines (including associate contractor inter-connections) are isolated from the facility ground. With the transporter system in the VIB, the isolation resistance shall not be less than 25,000 ohms. At the pad, Gemini fixed equipment and ITL back-up power supply for Gemini AGE (excluding transported system) shall each be tested for a D.C. negative isolation from facility ground of no less than 100,000 ohms. With the grounding contactors in a "closed" position, the resistance to facility ground shall not exceed 0.2 ohms.

3.3.3 Mechanical Installation Checkout - The mechanical installation of GFE in Table II shall be checked to verify:

a. Quality of workmanship

b. Compliance with requirements of the applicable installation drawings and the installation requirements of Section 3.2 herein.

* This page supersedes and replaces page 19 and incorporates SCN 1.

SUPPLEMENTARY

INFORMATION

MARTIN COMPANY
DENVER DIVISION

CONTRACT NO. AF04(695)-150

SPECIFICATION **CHANGE NOTICE**

NO. 2
DATE 25 May 1966

SPEC NO. MOL-EFT-ICS-5100
TITLE Installation and Checkout Specification for MOL-EFT-AGE
DATED 15 December 1965
REVISION NO. DATED

PURPOSE OF CHANGE: This change revises the list MOL-EFT-AGE which is installed.

This change incorporates SCNP-A (UCN 40038R1) as approved by SCD C3-3633 dated 22 April 1966. (Martin Ref. 6-W-06590)

INSTRUCTIONS: Replace Pages 13, 14, 15, and 16 with revised pages 13, 14, 15, and 16.

AUTHORIZATION: SCD C3-3633 dated 22 April 1966 (Martin Ref. 6-W-06590) and CCN 1704, dated 25 May 1966 (Martin Ref. 6-W-08318)

File this page in front of subject document to indicate the latest change.

W. B. Mabry Jr.
APPROVAL

Form DEN 10-6601 (9-65)

Note: Although the above mentioned complete installation end items actually comprise the total deliverable configuration of the MOL-HSQ program peculiar installation product at AMR (includes all efforts associated with the installation of both CFE and GFE items), the scope of this specification is concerned only with delivery of those portions of the total configuration which involve Contractor-Furnished material and effort required to install GFE items.

Those remaining portions of the total configuration which involve Contractor requirements for material and effort associated with the installation of CFE items shall be controlled within the scope of the Addendum I to SSS-TIII-OOR ICS/AMR Specification.

3.2.4.2 Installation End-Item Configuration and Control - Associated with each of the installation end-items identified in Paragraph 3.2.4.1 above is a corresponding installation drawing package which shall identify the hardware configuration of the major geographical area end-items and shall define all requirements for effort to be expended in producing that end-item. Each of the installation drawing packages identified in Para. 3.2.4.3. below shall embody the following MOL-HSQ Program requirements.

3.2.4.2.1 Fixed Installation of GFE - All GFE items required as part of a deliverable installation end-item and as listed in Table II herein (although such items are not actually considered to be procured as part of the installation end-item) shall be installed and located in the manner specified in the applicable installation drawing package.

(SCN 2) 3.2.4.2.2 Storage or Tie-Down Provisions for Mobile or Portable GFE Items - Provisions, as required, for suitable storage or tie-down of all GFE items listed in Table II that are in nature portable or mobile shall be included as part of the deliverable installation end-item in accordance with the applicable installation drawing package.

3.2.4.2.3 Installation Materials and Effort - All material and effort required to complete each installation end-item (excluding the procurement of GFE items listed in Table II) shall be provided as part of that end-item. Such material shall be identified and procured by the Contractor in accordance with instructions provided in the applicable installation drawing package.

3.2.4.2.4 Configuration Control - The initial scope of Contractor installation effort required to successfully support all MOL-HSQ Program requirements at AMR shall be defined as being that end-item configuration described by the basic released versions of each installation drawing package. All Class I modifications to the initial Contractor installation effort shall be identified in sub-paragraphs listed beneath each of the affected installation drawing packages identified in Paragraphs 3.2.4.3.1 and 3.2.4.3.2.

*This page supersedes and replaces Page 13 and incorporates SCN 2.

3.2.4.2.5 Installation Removal - The Contractor shall remove the two end-items in Paragraph 3.2.4.1 at the completion of the MOL-HSQ Program. However, prior to the completion of the HSQ Program, an analysis of the installed material and equipment shall be conducted to determine; 1) which items shall be removed; 2) which items shall be disconnected and stored in place; and 3) which items shall remain installed intact for possible future incorporation into the Titan III System.

3.2.4.3 Installation Drawing Packages - Each of the installation drawings in Paragraphs 3.2.4.3.1 and 3.2.4.3.2 correspond to and identify hardware configuration and effort required to complete one deliverable installation end-item as defined in Paragraph 3.2.4.1. Class I modifications to each end-item (which becomes fully defined upon basic release of the drawings) shall be identified in sub-paragraphs beneath each affected drawing package. Class I modifications shall be categorized beneath each of the drawing packages according to the implementing design discipline; i.e., Mechanical, Structural, Electrical Outfitting, Interconnections, and R. F. Transmission System.

3.2.4.3.1	808D1R00H00 (V)	Integrate, Transfer, and Launch Installation, MOL-HSQ
3.2.4.3.2	808D1R00G00 (V)	Launch Complex 40 MOL-HSQ

EQUIPMENT LIST, GFE

TABLE II

	MAC PART NO.	NOMENCLATURE	COMPLEX LC-40	ITL/ GEN
		Mechanical Age		
	52E420013	Pressurization Unit	X	
	52E420136	First Stage N_2 Regulator Panel	X	
(SCN 2)		Deleted		
(SCN 2)	52E420056	Second Stage N_2 Regulator Panel		X
(SCN 2)		Deleted		
	52E180139	RCS Emergency Purge N_2 Panel	X	
(SCN 2)	FM-3203 Socket John Henry Foster Co.	Shop Tool Air Disconnect	X	

*This page supersedes and replaces Page 14 and incorporates SCN 2.

EQUIPMENT LIST, GFE

TABLE II (CONT'D)

	MAC PART NO.	NOMENCLATURE	COMPLEX LC-40	ITL/ GEN
		Mechanical Age		
(SCN 2)	58E421217	GN_2 K-Bottle Cart	X	
(SCN 2)	58E181201	Coolant Umbilicals	X	X
(SCN 2)	63-678-1 Fairchild Stratos Co.	Oxidizer Vent Coupling	X	
(SCN 2)	63-680-1 Fairchild Stratos Co.	Fuel Vent Coupling	X	
(SCN 2)	1306-AR-16C Roylyn Inc.	GN_2 Nipple	X	
(SCN 2)	52E010013	Mobile Rack	X	
		Electrical Age		
	58E230802	Checkout Console-Power and Sequential (T/M System)		X
(SCN 2)	52E270063	Cabinet Assembly-Guidance and Control System Monitors		X
(SCN 2)	52E230068	Console Spacecraft Test Conductor		X
	52E420007	Control and Monitor Unit Propulsion System (RCS)		X
	52E440052	Power Supply Assembly Telemetry Remote-Displays		X
	58E440503	Remove Control Encoder		X
	MCE 0826	MAC Countdown Generator		X
	52E230058	Battery Rack-External Control and Monitor Back-up	X	
	52E180004	Service Unit - S/C Coolant System	X	
	52E180172-3	Coolant Unit, S/C Ground	X	
(SCN 2)	58E200508-0001	(1) Umbilical Cable 3.6" Diameter		X

*This page supersedes and replaces Page 15 and incorporates SCN 2.

EQUIPMENT LIST, GFE

TABLE II (CONT'D)

	MAC PART NO.		NOMENCLATURE	COMPLEX LC-40	ITL/ GEN
			Electrical Age		
(SCN 2)	58E200508-0047 through 0053, 0055, 0056, and 0063	(10)	Checkout Cables		X
(SCN 2)	58E200508-0021, 0022 and 0043	(3)	Battery Back-up Cables	X	
(SCN 2)	58E200508-0008, 0009, 0010, 0013, 0014, 0017, 0023, 0024, 0025 and 0042	(10)	Cables from MAC AGE Racks to Disconnect Panel Number 1		X
(SCN 2)	58E200508-002 through 0007, 0011, 0012, 0015, 0016, 0018, 0019, 0020, 0058 through 0062, 0088 0089, 0090, and 0094	(22)	Cables between MAC AGE Racks		X
(SCN 2)	58E200508-0026, 0027, 0028	(3)	Cables from GEEIA Interface MAC AGE		X
(SCN 2)	58E200508-0029 through 0032	(4)	Cables from GEEIA Interface to Disconnect Panel Number 2		X
(SCN 2)	58E200508-0033 through 0039	(7)	Cables from GEEIA Interface to OGE Van #1	X	
	(SCN 2)		Deleted		
	(SCN 2)		Deleted		
	(SCN 2)		Deleted		
(SCN 2)	58E190504-7		UHF Reradiating Antenna	X	
(SCN 2)	Radiatronics P/N 53063		C Band Reradiating Antenna	X	
(SCN 2)	58E200508-0093	(1)	Cable from MAC AGE Rack to J-Box L820 (PSO Interface)		X

*This page supersedes and replaces Page 16 and incorporates SCN 2.

MARTIN COMPANY
DENVER DIVISION

CONTRACT NO. AF04(695)-150

SPECIFICATION **CHANGE NOTICE**

NO. 3
DATE 7 June 1966

SPEC NO. MOL-EFT-ICS-5100
TITLE INSTALLATION AND CHECKOUT SPECIFICATION FOR MOL-EFT-AGE
DATED 15 December 1965
REVISION NO. DATED

PURPOSE OF CHANGE: This change revises Table II, Electrical AGE, of list MOL-EFT-AGE which is installed.

This change incorporates SCNP-C, Change Number C40062.

INSTRUCTIONS: Replace page 16 with revised page 16.

AUTHORIZATION: SCD C3-3662, dated 12 May 1966 (Martin Ref: 6-W-07406), and CCN 1695, dated 19 May 1966 (Martin Ref: 6-W-07995)

File this page in front of subject document to indicate the latest change.

APPROVAL

Form DEN 10180C (3-63)

EQUIPMENT LIST, GFE

TABLE II (cont.)

MAC PART NO.	NOMENCLATURE	COMPLEX LC-40	ITL/ GFE
	Electrical Age		
(SCN 2)58E200508-0047 through 0053, 0055, 0056, and 0063	(10) Checkout Cables		X
(SCN 3)58E200508-0021, -0022, 0043, and 0098	(4) Battery Back-up Cables	X	
(SCN 2)58E200508-0008, 0009, 0010, 0013, 0014, 0017, 0023, 0024, 0025 and 0042	(10) Cables from MAC AGE Racks to Disconnect Panel Number 1		X
(SCN 2)58E200508-002 through 0007, 0011, 0012, 0015, 0016, 0018, 0019, 0020, 0058 through 0062, 0088, 0089, 0090, and 0094	(22) Cables between MAC AGE Racks		X
(SCN 2)58E200508-0026, 0027, 0028	(3) Cables from GEEIA Interface MAC AGE		X
(SCN 2)58E200508-0029 through 0032	(4) Cables from GEEIA Interface to Disconnect Panel Number 2		X
(SCN 2)58E200508-0033 through 0039	(7) Cables from GEEIA Interface to OGE Van #1	X	
(SCN 2)	Deleted		
(SCN 2)	Deleted		
(SCN 2)	Deleted		
(SCN 2)58E190 -7	UHF Reradiating Antenna	X	
(SCN 2)Radiatronics P/N 53063	C Band Reradiating Antenna	X	
(SCN 2)58E200508-0093	(1) Cable from MAC AGE Rack to J-Box L820 (PSO Interface)		X

*This page supersedes and replaces page 16 and incorporates SCN 3, dated 7 June 1966.

SUPPLEMENTARY

INFORMATION

MARTIN COMPANY
DENVER DIVISION

CONTRACT NO. AF 04(695)-150

SPECIFICATION

CHANGE NOTICE

NO. 4
DATE 24 August 1966

SPEC NO. MOL-EFT-ICS-5100
TITLE Installation and Checkout Specification for MOL-EFT-AGE
DATED 15 December 1965
REVISION NO. DATED

PURPOSE OF CHANGE:

Revise MAC cable numbers. This change incorporates SCNP D (UCN 40066) as approved by SCD C3-3730, dated 21 July 1966 (Martin Ref 6W 10891)

INSTRUCTIONS: Replace page 16 with revised page 16*.

AUTHORIZATION: SCD C3-3730, dated 21 July 1966 (Martin Ref: 6W10891 and CCN 1780, dated 27 July 1966 (Martin Ref: 6W11698).

File this page in front of subject document to indicate the latest change.

APPROVAL

Form DRH .C 6.1 (9-65)

AD-477729

EQUIPMENT LIST, GFE

TABLE II (cont.)

	MAC PART NO.		NOMENCLATURE	COMPLEX LC-40	ITL/ GEN
			Electrical Age		
(SCN 4)	58E200508-0047 through 0049 0051, 0052, 0055, 0056, 0063, 0105 and 0107	(10)	Checkout Cables		X
(SCN 3)	58E200508-0021, -0022, 0043, and 0098	(4)	Battery Back-up Cables	X	
(SCN 4)	58E200508-0008, 0009, 0010, 0013, 0014, 0017, 0023, 0024, 0025, and 0112	(10)	Cables from MAC AGE Racks to Disconnect Panel Number 1		X
(SCN 4)	58E200508-002 through 0007, 0011, 0012, 0015, 0016, 0018, 0019, 0020, 0058, 0059, 0061, 0062, 0088, 0089, 0090, 0094, and 0106	(22)	Cables between MAC AGE Racks		X
(SCN 2)	58E200508-0026, 0027, 0028	(3)	Cables from GEEIA Interface MAC AGE		X
(SCN 2)	58E200508-0029 through 0032	(4)	Cables from GEEIA Interface to Disconnect Panel Number 2		X
(SCN 4)	58E200508-0037, 0038, 0039, 0108, 0109, 0110 and 0111	(7)	Cables from GEEIA Interface to OGE Van #1	X	
	(SCN 2)		Deleted		
	(SCN 2)		Deleted		
	(SCN 2)		Deleted		
(SCN 2)	58E190504-7		UHF Reradiating Antenna	X	
(SCN 2)	Radiatronics P/N 53063		C Band Reradiating Antenna	X	
(SCN 2)	58E200508-0093	(1)	Cable from MAC AGE Rack to J-Box L820 (PSO Interface)		X

* This page supersedes and replaces page 16 and incorporates SCN 4 dated 24 August 1966

SUPPLEMENTARY

INFORMATION

MARTIN COMPANY DENVER DIVISION

CONTRACT NO. AF04(695)-100

SPECIFICATION **CHANGE NOTICE**

NO. 5
DATE 20 December 1966

SPEC NO. MOL-EFT-ICS-5100
TITLE Installation and Checkout Specification for MOL-EFT-AGE
DATED 15 December 1965
REVISION NO. **DATED**

PURPOSE OF CHANGE:

Revise MAC cable numbers. This change incorporates SCNP E (UCN 40118) as approved by SCD C3-3909 dated 9 November 1966 (Martin Ref. 6-W-16179)

INSTRUCTIONS: Replace page 15 with revised page 15.

AUTHORIZATION: SCD C3-3909, dated 9 November 1966 (Martin Ref: 6-W-16179) and CCN 1974 dated 15 November 1966 (Martin Ref: 6-W-17051).

File this page in front of subject document to indicate the latest change.

G. E. Simmons
APPROVAL

Form DEN 101801 (9-66)

AD-477 729

EQUIPMENT LIST, GFE

TABLE II (CONT'D)

	MAC PART NO.	NOMENCLATURE	COMPLEX LC-40	ITL/ GEN
		Mechanical Age		
(SCN 2)	58E421217	GN_2 K-Bottle Cart	X	
(SCN 2)	58E181201	Coolant Umbilicals	X	X
(SCN 2)	63-678-1 Fairchild Stratos Co.	Oxidizer Vent Coupling	X	
(SCN 2)	63-680-1 Fairchild Stratos Co.	Fuel Vent Coupling	X	
(SCN 2)	1306-AR-16C Roylyn Inc.	GN_2 Nipple	X	
(SCN 2)	52E010013	Mobile Rack	X	
		Electrical Age		
	58E230802	Checkout Console-Power and Sequential (T/M System)		X
(SCN 2)	52E270063	Cabinet Assembly-Guidance and Control System Monitors		X
(SCN 2)	52E230068	Console Spacecraft Test Conductor		X
	52E420007	Control and Monitor Unit Propulsion System (RCS)		X
	52E440052	Power Supply Assembly Telemetry Remote-Displays		X
	58E440503	Remove Control Encoder		X
	MCE 0826	MAC Countdown Generator		X
	52E230058	Battery Rack-External Control and Monitor Back-up	X	
	52E180004	Service Unit - S/C Coolant System	X	
	52E180172-3	Coolant Unit, S/C Ground	X	
(SCN 5)	58E200508-A-603	(1) Umbilical Cable 3.6" Diameter		X

This page supersedes and replaces Page 15 and incorporates SCN 5 dated 20 December 1966